The firm export and FDI choice in the context of gravity

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ABSTRACT

In this paper, I show that in a theoretical environment where monopolistic competitive firms choose between exporting and servicing through a multinational with foreign direct investment (FDI), a gravity representation of exports and FDI can be derived. I then discuss the extent to which the resulting gravity equations are comparable and suggest a gravity-type regression that allows for direct interpretation of the differential effects of variables on exports and FDI.

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1. Introduction

The international trade and finance literature has gone far in understanding exporter and multinational behaviors. Theoretically, frameworks have been developed for understanding the firm level decision to service a country through exports or foreign direct investment. Empirically, and especially with the recent emergence of more disaggregated foreign direct investment (FDI) data, researchers have begun to untangle the effects of gravity on both exports and multinational/FDI trends. The literature has focused on the ability of bilateral distance and differences in cultural and other factors to determine flows between countries.

While understanding the firm level decisions and the effects of gravity continues to improve as more countries release disaggregated data, there are some key aspects linking the theoretical and empirical literatures which have yet to be fully examined. Many papers look at the firm level decision to service a foreign destination through either exports or FDI. Most often, the empirical literature separately looks at exports and FDI using gravity models though new research, such as Oldenski (2012), combines this analysis. But it has been previously unclear if the theory used allows researchers to generate the gravity equations used. This paper contributes to the literature by determining if and when the theoretical models used generate the gravity equations used in the empirical literature. I develop a model of monopolistic competition where firms choose to service a country through either exports or FDI, motivated by Helpman, Melitz, and Yeaple (2004). Following Chaney (2008), I then derive the gravity equations for product level exports and FDI from the theoretical choice model.

The usefulness of this exercise is two fold. First, where a relevant issue is the firm level choice of how to service a country, we see that gravity is still an appropriate framework to address both exports and FDI. Secondly, the theoretical model suggests an 'alternative' gravity framework which explicitly allows researchers to analyze the differential effects of gravity on exports and FDI.

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This paper is most similar to Kleinert and Toubal (2010) and Egger and Pfaffermayr (2004), both which develop monopolistic competition models of multinational firm activity and then analyze the model using aggregate flows (as opposed to sectoral). Kleinert and Toubal (2010) find that, in equilibrium, multinational entry into foreign destinations decreases with distance (in their model with heterogenous firms, multinational fixed entry costs increase with distance). Egger and Pfaffermayr (2004) from their model with three factors of production find that aggregate outward FDI stocks are negatively affected by distance while the effect on exports is insignificant (they assume distance affects both variable and fixed entry costs).

In the empirical literature, it is well documented that the gravity model is useful in understanding both exports and FDI flows. For example, Brenton, Di Mauro, and Lücke (1999) use a gravity model to analyze the impact of EU integration on FDI flows. More generally, Mitze, Björn, and Gerhard (2010) summarize the literature and show that gravity models are useful in understanding FDI flows. However, sectoral determinants have been found to be crucial in understanding the variation of FDI decisions across industries (see for example Antràs (2003), Yeaple (2006), Gleason, Lee, and Mathur (2002), Toubal, Kleinert, and Buch (2003), Toubal et al. (2003) and Schmeiser and Ricaurte (2012)). Oldenski (2012) analyzes the export to FDI ratio to determine the importance of information and other channels in determining sectoral flows.

Different than the existing theoretical literature, this paper takes a simple model analyzing the tradeoffs between exporting and FDI while allowing for product specific determinants as well as differences (both across products and servicing options) in fixed setup costs, tradability, contractual costs, transport costs, and other government incentives such as multinational tax exemptions. Egger and Pfaffermayr (2004) discuss that a benefit of including distance in the fixed entry cost of multinational firms is that it helps to capture the proximity concentration tradeoff, i.e., the further a destination and the more costly exports, FDI might seem relatively cheaper. While I do not explicitly model this, I do theoretically model the tradeoff between exports and FDI and allow for entry cost variation across servicing options. Empirically analyzing industry export/FDI variations then captures this tradeoff. With this approach, we can effectively see whether distance has stronger effects on exports or FDI (incorporating both the extensive and intensive margins). Note that another key difference is allowing for sectoral differences.

The paper continues as follows. Section 2 describes the model and assumptions on the export and FDI decisions of firms. Section 3 derives the gravity equations and discusses the differences between FDI and export determinants. Section 4 presents an alternate way of empirically analyzing the differential effects of gravity variables on exports and FDI. Finally, Section 5 concludes.

2. Model

I build on the monopolistic competition model in Schmeiser and Ricaurte (2012) (which itself builds on Helpman et al. (2004) and provides a more general interpretation of firm servicing costs). Firms are differentiated by their productivity as well as sectoral bilateral trade costs (fixed and variable) dependent on servicing mode. Sectoral variation in both the fixed and variable costs allows for differentiation both across sectors (for example, some products are easier to trade than others — lighter, less perishable, etc.) and across servicing modes (multinational activities may require larger fixed costs, contractual costs, multinational tax benefits, etc. while exporters face iceberg transportation and distribution costs).

Firms that pursue foreign markets decide whether and how to service each destination. As is typical in these models, I follow evidence presented by Blonigen (2001) and assume that firms exclusively choose between exports and FDI. Additionally, firms that participate in FDI neither do so in either a purely horizontal or vertical manner. This follows the works of Bernard, Jensen, and Schott (2005), Feinberg and Keane (2006), and Neary (2009) who find that the majority of multinational activity occurs in a hybrid format.

The representative consumer in each country has a typical CES utility on consumption with elasticity of substitution between goods of $\sigma > 1$. Countries differ exogenously in their income endowment Y_j and wages. They differ endogenously in the availability of the set of goods Ω_j, their aggregate price index P_j, and their aggregate consumption C_j.

In each country firms produce differentiated products. Firms producing good ω are defined by their productivity φ (distributed Pareto with shape parameter $\gamma > \sigma - 1$) and bilateral variable costs τ_{hij}^x, τ_{hij}^f and fixed costs f_{hij}^x, f_{hij}^f for firms producing product h, originating in country i, servicing destination j, either through exports (x) or FDI (f). Productivity distributions are weighted by country GDP, and can be easily adapted to vary according to sector. Additionally, the per unit cost of production w_{hi} varies across sectors (h) and country of production (i) (so firms producing varieties of t-shirts, one domestically and one foreign through a multinational, may pay different variable production costs).

In addition to iceberg transportation/variable costs τ_{hij}^x, τ_{hij}^f, I follow Schmeiser and Ricaurte (2012) and allow for variations in servicing costs and incentives both across sectors and modes (exporting versus FDI through a multinational). I assume that firms producing in product category h pay δ_{hij}^x, $\delta_{hij}^f > 0$ of their revenues in order to service a country in a particular manner. This is important because δ may be less than 1, allowing for subsidization and other informational costs. The intuition here is that multinationals sometimes receive tax relief, deal with different contractual costs, etc. Note that this model is not necessary to achieve the results in Section 3 but nests the more common models with δ_{hij}^x, $\delta_{hij}^f = 1$.

With profits $\pi_{hij}^k(\varphi) = \delta_{hij}^k p_{hij}^k(\varphi) x_{hij}(\varphi) - \frac{w}{\varphi} \tau_{hij}^k x_{hij} - f_{hij}^k$, Bertrand competition gives the price for each firm's output in each destination for exporting or FDI:

$$p_{hij}^x(\varphi) = \frac{\sigma}{\sigma-1} \frac{w_{hi} \tau_{hij}^x}{\delta_{hij}^x \varphi}, \text{ and } p_{hij}^f(\varphi) = \frac{\sigma}{\sigma-1} \frac{w_{hj} \tau_{hij}^f}{\delta_{hij}^f \varphi}.$$